



# SEQUENCE LISTING

<110> Willemssen, Petrus T.J.  
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<120> Paramycobacterial diagnostics and vaccines

<130> P54977US00

<140> US 10/501,127

<141> 2004-07-09

<150> PCT/NL03/00020

<151> 2003-01-13

<150> EP 02075089.9

<151> 2002-01-11

<160> 22

<170> PatentIn version 3.3

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Pro Ala Leu Ser Gly Gly Ala Thr Ser Thr Pro Gly Leu Ala Ser Pro  
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Gly Gly Ala Thr Ser Thr Pro Gly Leu Ala Ser Pro Gly Leu Gly Ser  
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 Ala Gln Gln Leu Asn Ser Ser Pro Met Ala Gln Ser Tyr Ile Gln Arg  
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cag ggc atg ccg gcc gcg cag cag tac atc aac gac atc aac cag gtc 342  
 Gln Gly Met Pro Ala Ala Gln Gln Tyr Ile Asn Asp Ile Asn Gln Val  
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Asn Ala Ser Asp Pro Ala Ala Ala Gln Gln Leu Asn Ser Ser Pro Met  
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Ala Gln Ser Tyr Ile Gln Arg Phe Leu Ala Ser Pro Pro Ala Lys Arg  
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 Val Ser Ser Asp Leu Phe Ser Gln Ile Val Asn Ser Gly Pro Gly Ser  
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ttt ctc gcc aag cag ctg ggc gtc ccg caa ccc gag acg ctg cgc cgc 153  
 Phe Leu Ala Lys Gln Leu Gly Val Pro Gln Pro Glu Thr Leu Arg Arg  
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tac cgg ccc ggt gac ccg ccg ctg gcc ggg tcg ctg ctg atc ggc ggc 201  
 Tyr Arg Pro Gly Asp Pro Pro Leu Ala Gly Ser Leu Leu Ile Gly Gly  
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gag ggc cgc gtg gtc gag ccg ctg cgg gcg gcg ctg gcc aag gac tac 249  
 Glu Gly Arg Val Val Glu Pro Leu Arg Ala Ala Leu Ala Lys Asp Tyr  
 55 60 65

gac ctg gtc ggc aac aac ctg ggc ggg cgc tgg gcc gac cgg ttc ggc 297  
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ggg ctg gtc ttc gac gcc acc ggg atc acc acc ccg gag ggc ctg aag 345  
 Gly Leu Val Phe Asp Ala Thr Gly Ile Thr Thr Pro Glu Gly Leu Lys  
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ggg ctg tac gag ttc ttc acc cca ctg ctg cgc aac ctg ggt cac tgc 393  
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Ala	Arg	Val	Val	Val	Val	Gly	Thr	Thr	Pro	Asp	Ala	Ala	Ala	Gly	Pro	
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cac	gag	cgg	atc	gcc	cag	cgc	gcc	ctg	gag	ggc	ttc	acc	cgg	tca	ttg	489
His	Glu	Arg	Ile	Ala	Gln	Arg	Ala	Leu	Glu	Gly	Phe	Thr	Arg	Ser	Leu	
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ggc	aag	gag	ctg	cgc	aac	ggc	tcg	acg	gtg	gcg	ctg	gtg	tac	ctg	tcg	537
Gly	Lys	Glu	Leu	Arg	Asn	Gly	Ser	Thr	Val	Ala	Leu	Val	Tyr	Leu	Ser	
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ccg	gcc	gcc	aaa	ccc	gcc	gcg	acg	ggc	ctg	gag	tcg	acc	atg	cgg	ttc	585
Pro	Ala	Ala	Lys	Pro	Ala	Ala	Thr	Gly	Leu	Glu	Ser	Thr	Met	Arg	Phe	
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Gly	Thr	Ala	Leu	Trp	Leu	Asp	Val	Thr	Ala	Pro	Asp	Ala	Val	Asp	Lys	
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Ile	Thr	Glu	His	Leu	Arg	Glu	His	His	Gly	Gly	His	Ala	Asp	Ile	Leu	
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Arg	Ile	Val	Gly	Leu	Ser	Ser	Met	Ala	Gly	Ile	Ala	Gly	Asn	Arg	Gly	
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cag	acc	aac	tac	gcc	acc	acc	aag	gca	ggc	atg	atc	ggc	ctc	acc	cag	1161
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Ala Leu Ala Pro Glu Leu Tyr Asp Lys Gly Ile Thr Ile Asn Ala Val	
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gcg ccg gga ttc atc gag acc cag atg acg gcc gcc atc ccg ctg gcc	1257
Ala Pro Gly Phe Ile Glu Thr Gln Met Thr Ala Ala Ile Pro Leu Ala	
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Thr Arg Glu Val Gly Arg Arg Met Asn Ser Leu Leu Gln Gly Gly Gln	
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Pro Val Asp Val Ala Glu Thr Ile Ala Tyr Phe Ala Ser Pro Ala Ser	
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Leu Ile Gly Gly Glu Gly Arg Val Val Glu Pro Leu Arg Ala Ala Leu
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Ala Lys Asp Tyr Asp Leu Val Gly Asn Asn Leu Gly Gly Arg Trp Ala
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Asp Arg Phe Gly Gly Leu Val Phe Asp Ala Thr Gly Ile Thr Thr Pro
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Val Tyr Leu Ser Pro Ala Ala Lys Pro Ala Ala Thr Gly Leu Glu Ser 165 170 175		
Thr Met Arg Phe Ile Leu Ser Ala Lys Ser Ala Tyr Val Asp Gly Gln 180 185 190		
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Arg Pro Leu Asp Gly Lys Val Ala Ile Val Thr Gly Ala Ala Arg Gly 210 215 220		
Ile Gly Ala Thr Ile Ala Glu Val Phe Ala Arg Asp Gly Ala Arg Val 225 230 235 240		
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Ser Arg Val Gly Gly Thr Ala Leu Trp Leu Asp Val Thr Ala Pro Asp 260 265 270		
Ala Val Asp Lys Ile Thr Glu His Leu Arg Glu His His Gly Gly His 275 280 285		
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Ala Asn Met Asp Asp Ala Arg Trp Asp Ala Val Leu Ala Val Asn Leu 305 310 315 320		
Leu Ala Pro Leu Arg Leu Thr Glu Gly Leu Val Gly Asn Gly Ser Ile 325 330 335		
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370

375

380

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Ile Pro Leu Ala Thr Arg Glu Val Gly Arg Arg Met Asn Ser Leu Leu  
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Gln Gly Gly Gln Pro Val Asp Val Ala Glu Thr Ile Ala Tyr Phe Ala  
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atg ctg gtc gcc acg gtg cgg gcg ttc atc gac cgc gag gtc aaa ccg 226  
Met Leu Val Ala Thr Val Arg Ala Phe Ile Asp Arg Glu Val Lys Pro  
1 5 10 15  
acc gtg cgc gag gtg gag cac gcc gat gcc tat ccc gag gcg tgg atc 274  
Thr Val Arg Glu Val Glu His Ala Asp Ala Tyr Pro Glu Ala Trp Ile  
20 25 30  
gag cag atg aag cgg atc ggg atc tac ggg ctg gcg gtg ccc gag gaa 322  
Glu Gln Met Lys Arg Ile Gly Ile Tyr Gly Leu Ala Val Pro Glu Glu  
35 40 45  
tac ggt ggt tcg ccg gtg tcc atg ccg tgc tac gtg cgg gtc acc gag 370  
Tyr Gly Gly Ser Pro Val Ser Met Pro Cys Tyr Val Arg Val Thr Glu  
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acc gtg gtg gcc aag ctg cta acg ctg ttc ggc acc gag gac cas aag Thr Val Val Ala Lys Leu Leu Thr Leu Phe Gly Thr Glu Asp Xaa Lys 85 90 95			466
cgg gcc tac ctg ccg cgg atg gcc agc ggc gaa atc cgg gcc acc atg Arg Ala Tyr Leu Pro Arg Met Ala Ser Gly Glu Ile Arg Ala Thr Met 100 105 110			514
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<220>  
 <221> misc\_feature  
 <222> (118)..(118)  
 <223> The 'Xaa' at location 118 stands for Gly, or Arg.

<220>  
 <221> misc\_feature  
 <222> (147)..(147)  
 <223> The 'Xaa' at location 147 stands for Trp, or Cys.

<400> 10

Met Leu Val Ala Thr Val Arg Ala Phe Ile Asp Arg Glu Val Lys Pro  
 1 5 10 15

Thr Val Arg Glu Val Glu His Ala Asp Ala Tyr Pro Glu Ala Trp Ile  
 20 25 30

Glu Gln Met Lys Arg Ile Gly Ile Tyr Gly Leu Ala Val Pro Glu Glu  
 35 40 45

Tyr Gly Gly Ser Pro Val Ser Met Pro Cys Tyr Val Arg Val Thr Glu  
 50 55 60

Gln Leu Ala Arg Gly Trp Met Ser Leu Ala Gly Ala Met Gly Gly His  
65 70 75 80

Thr Val Val Ala Lys Leu Leu Thr Leu Phe Gly Thr Glu Asp Xaa Lys  
85 90 95

Arg Ala Tyr Leu Pro Arg Met Ala Ser Gly Glu Ile Arg Ala Thr Met  
100 105 110

Ala Leu Thr Glu Pro Xaa Gly Gly Ser Asp Leu Gln Asn Met Ser Thr  
115 120 125

Thr Ala Leu Pro Asp Pro Asp Ser Asp Gly Leu Val Val Asn Gly Ala  
130 135 140

Lys Thr Xaa Ile Asn  
145

<210> 11  
<211> 241  
<212> DNA  
<213> Mycobacterium avium

<220>  
<221> CDS  
<222> (147)..(239)

<400> 11  
gtgggggcaa gccattacg ttcgcatcga cccggcacag gcggtcgctc acgtcatcaa 60  
catgccgctc atccccgatg aggctcgaat gaccttgcta cgcaggcgct gaacgcacga 120  
cgaaacggac cggaggtgaa agggac atg agc cac gcc gat caa ctc gct cgg 173  
Met Ser His Ala Asp Gln Leu Ala Arg  
1 5  
acg cac ctg gcg ccc gat cct gcg gac ctg tcg cgc ctg gtc gcc ggc 221  
Thr His Leu Ala Pro Asp Pro Ala Asp Leu Ser Arg Leu Val Ala Gly  
10 15 20 25  
acc cac cac gac ccg cac gg 241  
Thr His His Asp Pro His  
30

<210> 12  
<211> 31  
<212> PRT  
<213> Mycobacterium avium

<400> 12  
Met Ser His Ala Asp Gln Leu Ala Arg Thr His Leu Ala Pro Asp Pro  
1 5 10 15

Ala Asp Leu Ser Arg Leu Val Ala Gly Thr His His Asp Pro His  
 20 25 30

<210> 13  
 <211> 236  
 <212> DNA  
 <213> Mycobacterium avium

<220>  
 <221> CDS  
 <222> (8)..(214)

<400> 13  
 ggacacc aac gtg acc ggg gtg ttt ctc acc gcc cag gcg gcg gcc cgg 49  
 Asn Val Thr Gly Val Phe Leu Thr Ala Gln Ala Ala Ala Arg  
 1 5 10  
 gcg atg atg cgg cag ggc cgc ggc ggc gcc atc atc acc acc gcc tcg 97  
 Ala Met Met Arg Gln Gly Arg Gly Gly Ala Ile Ile Thr Thr Ala Ser  
 15 20 25 30  
 atg tcc ggg cac atc atc aac gtc ccg cag cag gtc ggc cac tac tgc 145  
 Met Ser Gly His Ile Ile Asn Val Pro Gln Gln Val Gly His Tyr Cys  
 35 40 45  
 gcc agc aag gcg gcc gtg atc cag ctg acc aag gcc atg gcc gtc gaa 193  
 Ala Ser Lys Ala Ala Val Ile Gln Leu Thr Lys Ala Met Ala Val Glu  
 50 55 60  
 ttc tgc agg atc cgt cga ctc tagactcgag caagcttatg ca 236  
 Phe Cys Arg Ile Arg Arg Leu  
 65

<210> 14  
 <211> 69  
 <212> PRT  
 <213> Mycobacterium avium

<400> 14  
 Asn Val Thr Gly Val Phe Leu Thr Ala Gln Ala Ala Ala Arg Ala Met  
 1 5 10 15  
 Met Arg Gln Gly Arg Gly Gly Ala Ile Ile Thr Thr Ala Ser Met Ser  
 20 25 30  
 Gly His Ile Ile Asn Val Pro Gln Gln Val Gly His Tyr Cys Ala Ser  
 35 40 45  
 Lys Ala Ala Val Ile Gln Leu Thr Lys Ala Met Ala Val Glu Phe Cys  
 50 55 60  
 Arg Ile Arg Arg Leu  
 65

<210> 15



<222> (103)..(103)  
 <223> The 'xaa' at location 103 stands for Met, Val, or Leu.

<220>  
 <221> misc\_feature  
 <222> (125)..(125)  
 <223> The 'xaa' at location 125 stands for Lys, Arg, Thr, or Met.

<400> 16

Met Thr His Thr Lys Ala Gly Arg Ala Ala Trp Pro Ala Ala Cys Ala  
 1 5 10 15

Val Val Leu Ser Ala Ala Ala Leu Leu Cys Ala Ala Ala Ala Ala Ala  
 20 25 30

Asp Glu Ala Asp Asp Ala Phe Leu Ala Gly Leu Ala Lys Gly Gly Ile  
 35 40 45

Thr Met Phe Asp Asp Asp Asp Ala Ile Ala Met Gly His Ser Val Cys  
 50 55 60

Ser Ser Ile Asp Ala Asn Pro Asn Val Ser Met Leu Ala Leu Arg Leu  
 65 70 75 80

Thr Lys Gln Thr Pro Leu Thr Pro Lys Gln Ser Gly Tyr Phe Ile Gly  
 85 90 95

Leu Ser Val Ala Ser Tyr Xaa Pro Ala Val Gln Gly Arg Arg Arg Pro  
 100 105 110

Leu Ala Gly Leu Ala Asp Pro Ala Ala Ala Asp Val Xaa Leu Pro Ala  
 115 120 125

Gly Ile Gly  
 130

<210> 17  
 <211> 392  
 <212> DNA  
 <213> Mycobacterium avium

<220>  
 <223> paratuberculosis protein gene

<220>  
 <221> CDS  
 <222> (94)..(390)

<400> 17  
 cggcgtagca tcgtcaagtc gttgcccgcg ctgatgccgg agcggcagta aggagttcgg 60  
 ctggtgcaaa aacgcttgcc cacagtcggt ttg gtg ctg acg gcc gtt gtc gcc 114  
 Val Leu Thr Ala Val Val Ala  
 16



	1	5	
ggt atc gcc ggg tgc agc gcg gcg cag acc gtg ccg cgc aag gcc gcc			162
Gly Ile Ala Gly Cys Ser Ala Ala Gln Thr Val Pro Arg Lys Ala Ala	10	20	
cgg ctg acc atc gac ggt gcc acc cac acg acc cgc ccg ccg tcc tgc			210
Arg Leu Thr Ile Asp Gly Ala Thr His Thr Thr Arg Pro Pro Ser Cys	25	35	
cgg cag gac cag atg tat cgg acc atc aac atc ccc gac cac gac ggt			258
Arg Gln Asp Gln Met Tyr Arg Thr Ile Asn Ile Pro Asp His Asp Gly	40	50	55
gga gtc gaa gcg gtg gtg ctg ctc agc ggt tac cgg gtg atg ccg cag			306
Gly Val Glu Ala Val Val Leu Leu Ser Gly Tyr Arg Val Met Pro Gln	60	65	70
tgg gtg aag atc cgg aac gtc gac ggc ttc acc ggc agt cta ctg gcc			354
Trp Val Lys Ile Arg Asn Val Asp Gly Phe Thr Gly Ser Leu Leu Ala	75	80	85
asg gcg gag tgg gcg acg cgc acg tcg atc tca cma at			392
Xaa Ala Glu Trp Ala Thr Arg Thr Ser Ile Ser Xaa	90	95	

<210> 18  
 <211> 99  
 <212> PRT  
 <213> Mycobacterium avium  
  
 <220>  
 <221> misc\_feature  
 <222> (88)..(88)  
 <223> The 'Xaa' at location 88 stands for Arg, or Thr.  
  
 <220>  
 <221> misc\_feature  
 <222> (99)..(99)  
 <223> The 'Xaa' at location 99 stands for Gln, or Pro.  
  
 <400> 18

Val Leu Thr Ala Val Val Ala Gly Ile Ala Gly Cys Ser Ala Ala Gln	1	5	10	15
Thr Val Pro Arg Lys Ala Ala Arg Leu Thr Ile Asp Gly Ala Thr His	20	25	30	
Thr Thr Arg Pro Pro Ser Cys Arg Gln Asp Gln Met Tyr Arg Thr Ile	35	40	45	
Asn Ile Pro Asp His Asp Gly Gly Val Glu Ala Val Val Leu Leu Ser	50	55	60	
Gly Tyr Arg Val Met Pro Gln Trp Val Lys Ile Arg Asn Val Asp Gly	65	70	75	80

Phe Thr Gly Ser Leu Leu Ala Xaa Ala Glu Trp Ala Thr Arg Thr Ser  
85 90 95

Ile Ser Xaa

<210> 19  
<211> 1884  
<212> DNA  
<213> Mycobacterium avium

<220>  
<221> CDS  
<222> (13)..(1884)

<400> 19  
taaccaggag ca atg gct cgt gcg gtc ggt atc gac ctc ggg acc acc aac 51  
Met Ala Arg Ala Val Gly Ile Asp Leu Gly Thr Thr Asn  
1 5 10

tcc gtc gtc gca gtc ctc gag ggc ggt gac ccc gtc gtc gtc gcc aac 99  
Ser Val Val Ala Val Leu Glu Gly Gly Asp Pro Val Val Val Ala Asn  
15 20 25

tcc gag ggc tcg cgg acc acc ccg tcc atc gtc gcg ttc gcc cgc aac 147  
Ser Glu Gly Ser Arg Thr Pro Ser Ile Val Ala Phe Ala Arg Asn  
30 35 40 45

ggc gag gtg ctc gtc ggc cag ccc gcc aag aac cag gcg gtg acc aac 195  
Gly Glu Val Leu Val Gly Gln Pro Ala Lys Asn Gln Ala Val Thr Asn  
50 55 60

gtc gac cgc acc atc cgt tcg gtc aag cgg cac atg ggc acc gac tgg 243  
Val Asp Arg Thr Ile Arg Ser Val Lys Arg His Met Gly Thr Asp Trp  
65 70 75

tcc atc gag atc gac ggc aag aaa tac acc gct cag gag atc agc gcc 291  
Ser Ile Glu Ile Asp Gly Lys Lys Tyr Thr Ala Gln Glu Ile Ser Ala  
80 85 90

cgc gtg ctg atg aag ctc aag cgc gac gcc gag gcc tat ctg ggt gag 339  
Arg Val Leu Met Lys Leu Lys Arg Asp Ala Glu Ala Tyr Leu Gly Glu  
95 100 105

gac atc acc gac gcg gtc atc acc gta ccg gcg tac ttc aac gac gcc 387  
Asp Ile Thr Asp Ala Val Ile Thr Val Pro Ala Tyr Phe Asn Asp Ala  
110 115 120 125

cag cgt cag gcg acc aag gaa gcc ggc cag atc gcc ggc ctc aac gtg 435  
Gln Arg Gln Ala Thr Lys Glu Ala Gly Gln Ile Ala Gly Leu Asn Val  
130 135 140

ctg cgc atc gtc aac gag ccg acc gcg gcc gcg ctg gcc tac ggc ctg 483  
Leu Arg Ile Val Asn Glu Pro Thr Ala Ala Ala Leu Ala Tyr Gly Leu  
145 150 155

gac aag ggc gag aag gag cag acc atc ctg gtc ttc gac ctc ggc ggc 531  
Asp Lys Gly Glu Lys Glu Gln Thr Ile Leu Val Phe Asp Leu Gly Gly  
160 165 170

ggc acg ttc gac gtt tcg ctg ctc gag atc ggc gag ggt gtg gtc gag 579  
18

Gly	Thr	Phe	Asp	Val	Ser	Leu	Leu	Glu	Ile	Gly	Glu	Gly	Val	Val	Glu		
175						180					185						
gtc	cgc	gcc	acc	agc	ggt	gac	aac	caa	ctc	ggt	ggc	gac	gac	tgg	gac	627	
Val	Arg	Ala	Thr	Ser	Gly	Asp	Asn	Gln	Leu	Gly	Gly	Asp	Asp	Trp	Asp	205	
190					195					200							
gac	cgg	atc	gtc	aac	tgg	ctg	gtc	gac	aag	ttc	aag	ggc	acc	agc	ggc	675	
Asp	Arg	Ile	Val	Asn	Trp	Leu	Val	Asp	Lys	Phe	Lys	Gly	Thr	Ser	Gly	220	
				210					215								
atc	gac	ctg	acc	aag	gac	aag	atg	gcc	atg	cag	cgg	ctg	cgt	gag	gcc	723	
Ile	Asp	Leu	Thr	Lys	Asp	Lys	Met	Ala	Met	Gln	Arg	Leu	Arg	Glu	Ala	235	
			225					230									
gcc	gag	aag	gcc	aag	atc	gag	ttg	tcc	agc	tcg	cag	agc	acc	tcg	atc	771	
Ala	Glu	Lys	Ala	Lys	Ile	Glu	Leu	Ser	Ser	Ser	Gln	Ser	Thr	Ser	Ile	250	
		240					245										
aac	ctg	ccc	tac	atc	acc	gtc	gac	gcg	gac	aag	aac	ccg	ctg	ttc	ctc	819	
Asn	Leu	Pro	Tyr	Ile	Thr	Val	Asp	Ala	Asp	Lys	Asn	Pro	Leu	Phe	Leu	265	
	255					260					265						
gac	gag	cag	ctg	acc	cgc	gcc	gaa	ttc	cag	cgc	atc	acc	cag	gat	ctg	867	
Asp	Glu	Gln	Leu	Thr	Arg	Ala	Glu	Phe	Gln	Arg	Ile	Thr	Gln	Asp	Leu	285	
					275					280							
ctg	gac	cgc	acc	cgt	cag	ccg	ttc	aag	tcg	gtg	atc	gcc	gac	gcc	ggc	915	
Leu	Asp	Arg	Thr	Arg	Gln	Pro	Phe	Lys	Ser	Val	Ile	Ala	Asp	Ala	Gly	300	
				290					295								
atc	tcg	gtg	tcc	gac	atc	gac	cac	gtg	gtg	ctg	gtg	ggt	ggt	tcc	acc	963	
Ile	Ser	Val	Ser	Asp	Ile	Asp	His	Val	Val	Leu	Val	Gly	Gly	Ser	Thr	315	
			305					310									
cgg	atg	ccc	gcg	gtg	acc	gac	ctg	gtc	aag	gaa	ctc	acc	ggc	ggc	aag	1011	
Arg	Met	Pro	Ala	Val	Thr	Asp	Leu	Val	Lys	Glu	Leu	Thr	Gly	Gly	Lys	330	
		320					325										
gag	ccc	aac	aag	ggc	gtc	aac	ccc	gac	gag	gtt	gtc	gcg	gtg	ggt	gcc	1059	
Glu	Pro	Asn	Lys	Gly	Val	Asn	Pro	Asp	Glu	Val	Val	Ala	Val	Gly	Ala	345	
	335					340											
gcc	ctg	cag	gcc	ggt	gtg	ctt	aag	ggc	gag	gtg	aaa	gac	gtt	ctg	ctg	1107	
Ala	Leu	Gln	Ala	Gly	Val	Leu	Lys	Gly	Glu	Val	Lys	Asp	Val	Leu	Leu	365	
				355						360							
ctt	gac	gtt	acg	ccg	ctg	agc	ctg	ggt	atc	gag	acc	aag	ggt	ggc	gtg	1155	
Leu	Asp	Val	Thr	Pro	Leu	Ser	Leu	Gly	Ile	Glu	Thr	Lys	Gly	Gly	Val	380	
				370					375								
atg	acc	aag	ctg	atc	gaa	cgc	aac	acc	acc	atc	ccg	acc	aag	cgg	tcc	1203	
Met	Thr	Lys	Leu	Ile	Glu	Arg	Asn	Thr	Thr	Ile	Pro	Thr	Lys	Arg	Ser	395	
			385					390									
gag	acg	ttc	acc	acg	gcc	gac	gac	aac	cag	ccg	tcg	gtg	cag	atc	cag	1251	
Glu	Thr	Phe	Thr	Thr	Ala	Asp	Asp	Asn	Gln	Pro	Ser	Val	Gln	Ile	Gln	410	
		400					405										
gtg	tat	cag	ggt	gag	cgc	gaa	atc	gcc	gcg	cac	aac	aag	ctg	ctc	ggc	1299	
Val	Tyr	Gln	Gly	Glu	Arg	Glu	Ile	Ala	Ala	His	Asn	Lys	Leu	Leu	Gly	425	
	415					420											
tcc	ttc	gag	ctg	acc	gga	att	ccg	ccg	gcg	ccc	cgc	ggc	gtg	ccg	cag	1347	
										19							

Ser 430	Phe	Glu	Leu	Thr	Gly 435	Ile	Pro	Pro	Ala	Pro 440	Arg	Gly	Val	Pro	Gln 445	
atc Ile	gag Glu	gtc Val	acc Thr	ttc Phe 450	gac Asp	atc Ile	gac Asp	gcc Ala	aac Asn 455	ggc Gly	atc Ile	gtg Val	cac His	gtc Val 460	acc Thr	1395
gcc Ala	aag Lys	gac Asp	aag Lys 465	ggc Gly	acc Thr	ggt Gly	aag Lys	gag Glu 470	aac Asn	acg Thr	atc Ile	aag Lys	atc Ile 475	cag Gln	gag Glu	1443
ggc Gly	tcc Ser	ggc Gly 480	ctg Leu	tcc Ser	aag Lys	gag Glu	gag Glu 485	atc Ile	gac Asp	cgg Arg	atg Met	atc Ile 490	aag Lys	gac Asp	gcc Ala	1491
gag Glu	gcg Ala 495	cac His	gcc Ala	gag Glu	gag Glu	gac Asp 500	cgc Arg	aag Lys	agg Arg	cgc Arg	gag Glu 505	gaa Glu	gcc Ala	gac Asp	gtc Val	1539
cgc Arg 510	aac Asn	caa Gln	gcg Ala	gaa Glu	tcg Ser 515	ctt Leu	gtc Val	tac Tyr	cag Gln	acg Thr 520	gag Glu	aag Lys	ttc Phe	gtc Val	aag Lys 525	1587
gac Asp	cag Gln	cgc Arg	gag Glu	gcc Ala 530	gag Glu	ggc Gly	ggc Gly	tcg Ser	aag Lys 535	gtt Val	ccc Pro	gag Glu	gag Glu	acg Thr 540	ctg Leu	1635
tcc Ser	aag Lys	gtc Val	gac Asp 545	gcc Ala	gcg Ala	atc Ile	gcc Ala	gac Asp 550	gcc Ala	aag Lys	acg Thr	gcc Ala	ctg Leu 555	ggc Gly	ggc Gly	1683
acc Thr	gac Asp	atc Ile 560	acc Thr	gcg Ala	atc Ile	aag Lys	tcg Ser 565	gcg Ala	atg Met	gag Glu	aag Lys	ctc Leu 570	ggc Gly	cag Gln	gag Glu	1731
tcg Ser	caa Gln 575	gcg Ala	ctg Leu	gga Gly	cag Gln	gca Ala 580	atc Ile	tac Tyr	gag Glu	gcc Ala	acc Thr 585	cag Gln	gcc Ala	gag Glu	tcc Ser	1779
gcc Ala 590	cag Gln	gct Ala	ggc Gly	ggg Gly	ccg Pro 595	gac Asp	ggt Gly	gcc Ala	gcg Ala	gcc Ala 600	ggc Gly	ggc Gly	ggg Gly	tcc Ser	gga Gly 605	1827
tcc Ser	gcc Ala	gac Asp	gat Asp	gtt Val 610	gtg Val	gac Asp	gcg Ala	gag Glu	gtg Val 615	gtc Val	gac Asp	gat Asp	gac Asp	cgg Arg 620	gag Glu	1875
tcc Ser	aag Lys	tga														1884

<210> 20  
 <211> 623  
 <212> PRT  
 <213> Mycobacterium avium

<400> 20

Met Ala Arg Ala Val Gly Ile Asp Leu Gly Thr Thr Asn Ser Val Val  
 1 5 10 15

Ala Val Leu Glu Gly Gly Asp Pro Val Val Val Ala Asn Ser Glu Gly  
 20

20

25

30

Ser Arg Thr Thr Pro Ser Ile Val Ala Phe Ala Arg Asn Gly Glu Val  
35 40 45

Leu Val Gly Gln Pro Ala Lys Asn Gln Ala Val Thr Asn Val Asp Arg  
50 55 60

Thr Ile Arg Ser Val Lys Arg His Met Gly Thr Asp Trp Ser Ile Glu  
65 70 75 80

Ile Asp Gly Lys Lys Tyr Thr Ala Gln Glu Ile Ser Ala Arg Val Leu  
85 90 95

Met Lys Leu Lys Arg Asp Ala Glu Ala Tyr Leu Gly Glu Asp Ile Thr  
100 105 110

Asp Ala Val Ile Thr Val Pro Ala Tyr Phe Asn Asp Ala Gln Arg Gln  
115 120 125

Ala Thr Lys Glu Ala Gly Gln Ile Ala Gly Leu Asn Val Leu Arg Ile  
130 135 140

Val Asn Glu Pro Thr Ala Ala Ala Leu Ala Tyr Gly Leu Asp Lys Glu  
145 150 155 160

Glu Lys Glu Gln Thr Ile Leu Val Phe Asp Leu Gly Gly Gly Thr Phe  
165 170 175

Asp Val Ser Leu Leu Glu Ile Gly Glu Gly Val Val Glu Val Arg Ala  
180 185 190

Thr Ser Gly Asp Asn Gln Leu Gly Gly Asp Asp Trp Asp Asp Arg Ile  
195 200 205

Val Asn Trp Leu Val Asp Lys Phe Lys Gly Thr Ser Gly Ile Asp Leu  
210 215 220

Thr Lys Asp Lys Met Ala Met Gln Arg Leu Arg Glu Ala Ala Glu Lys  
225 230 235 240

Ala Lys Ile Glu Leu Ser Ser Ser Gln Ser Thr Ser Ile Asn Leu Pro  
245 250 255

Tyr Ile Thr Val Asp Ala Asp Lys Asn Pro Leu Phe Leu Asp Glu Gln  
260 265 270

Leu Thr Arg Ala Glu Phe Gln Arg Ile Thr Gln Asp Leu Leu Asp Arg  
21

275

280

285

Thr Arg Gln Pro Phe Lys Ser Val Ile Ala Asp Ala Gly Ile Ser Val  
 290 295 300

Ser Asp Ile Asp His Val Val Leu Val Gly Gly Ser Thr Arg Met Pro  
 305 310 315 320

Ala Val Thr Asp Leu Val Lys Glu Leu Thr Gly Gly Lys Glu Pro Asn  
 325 330 335

Lys Gly Val Asn Pro Asp Glu Val Val Ala Val Gly Ala Ala Leu Gln  
 340 345 350

Ala Gly Val Leu Lys Gly Glu Val Lys Asp Val Leu Leu Leu Asp Val  
 355 360 365

Thr Pro Leu Ser Leu Gly Ile Glu Thr Lys Gly Gly Val Met Thr Lys  
 370 375 380

Leu Ile Glu Arg Asn Thr Thr Ile Pro Thr Lys Arg Ser Glu Thr Phe  
 385 390 395 400

Thr Thr Ala Asp Asp Asn Gln Pro Ser Val Gln Ile Gln Val Tyr Gln  
 405 410 415

Gly Glu Arg Glu Ile Ala Ala His Asn Lys Leu Leu Gly Ser Phe Glu  
 420 425 430

Leu Thr Gly Ile Pro Pro Ala Pro Arg Gly Val Pro Gln Ile Glu Val  
 435 440 445

Thr Phe Asp Ile Asp Ala Asn Gly Ile Val His Val Thr Ala Lys Asp  
 450 455 460

Lys Gly Thr Gly Lys Glu Asn Thr Ile Lys Ile Gln Glu Gly Ser Gly  
 465 470 475 480

Leu Ser Lys Glu Glu Ile Asp Arg Met Ile Lys Asp Ala Glu Ala His  
 485 490 495

Ala Glu Glu Asp Arg Lys Arg Arg Glu Glu Ala Asp Val Arg Asn Gln  
 500 505 510

Ala Glu Ser Leu Val Tyr Gln Thr Glu Lys Phe Val Lys Asp Gln Arg  
 515 520 525

Glu Ala Glu Gly Gly Ser Lys Val Pro Glu Glu Thr Leu Ser Lys Val  
 22

530

535

540

Asp Ala Ala Ile Ala Asp Ala Lys Thr Ala Leu Gly Gly Thr Asp Ile  
545 550 555 560

Thr Ala Ile Lys Ser Ala Met Glu Lys Leu Gly Gln Glu Ser Gln Ala  
565 570 575

Leu Gly Gln Ala Ile Tyr Glu Ala Thr Gln Ala Glu Ser Ala Gln Ala  
580 585 590

Gly Gly Pro Asp Gly Ala Ala Ala Gly Gly Gly Ser Gly Ser Ala Asp  
595 600 605

Asp Val Val Asp Ala Glu Val Val Asp Asp Asp Arg Glu Ser Lys  
610 615 620

<210> 21  
<211> 1701  
<212> DNA  
<213> Mycobacterium avium

<220>  
<221> CDS  
<222> (76)..(1701)

<400> 21  
gcagcctggg cgtccgtcgc gggcactgca cccggccagg acgtgtcatc cccaatccgg 60

aggaatcact tcgca atg gcc aag aca att gcg tac gac gaa gag gcc cgt 111  
Met Ala Lys Thr Ile Ala Tyr Asp Glu Glu Ala Arg  
1 5 10

cgc ggc ctc gag cgg ggg ctc aac gcc ctc gcc gac gcg gta aag gtc 159  
Arg Gly Leu Glu Arg Gly Leu Asn Ala Leu Ala Asp Ala Val Lys Val  
15 20 25

acg ttg ggc ccc aag ggt cgc aac gtc gtc ctg gag aag aag tgg ggt 207  
Thr Leu Gly Pro Lys Gly Arg Asn Val Val Leu Glu Lys Lys Trp Gly  
30 35 40

gcc ccc acg atc acc aac gat ggt gtg tcc atc gcc aag gag atc gag 255  
Ala Pro Thr Ile Thr Asn Asp Gly Val Ser Ile Ala Lys Glu Ile Glu  
45 50 55 60

ctg gag gac ccg tac gag aag atc ggc gcc gag ctg gtc aag gaa gtc 303  
Leu Glu Asp Pro Tyr Glu Lys Ile Gly Ala Glu Leu Val Lys Glu Val  
65 70 75

gcc aag aag acc gac gac gtc gcc ggt gac ggc acg acg acg gcc acg 351  
Ala Lys Lys Thr Asp Asp Val Ala Gly Asp Gly Thr Thr Thr Ala Thr  
80 85 90

gtg ctc gcc cag gcg ttg gtc cgc gag ggc ctg cgc aac gtc gcg gcc 399  
Val Leu Ala Gln Ala Leu Val Arg Glu Gly Leu Arg Asn Val Ala Ala  
95 100 105

ggc gcc aac ccg ctg ggt ctc aag cgc ggc atc gag aag gcc gtc gag Gly Ala Asn Pro Leu Gly Leu Lys Arg Gly Ile Glu Lys Ala Val Glu 110 115 120	447
aag gtc acc gag acc ctg ctc aag tcg gcc aag gag gtc gag acc aag Lys Val Thr Glu Thr Leu Leu Lys Ser Ala Lys Glu Val Glu Thr Lys 125 130 135 140	495
gac cag atc gct gcc acc gcg gcc atc tcc gcg ggc gac cag tcg atc Asp Gln Ile Ala Ala Thr Ala Ala Ile Ser Ala Gly Asp Gln Ser Ile 145 150 155	543
ggc gac ctg atc gcc gag gcg atg gac aag gtc ggc aac gag ggc gtc Gly Asp Leu Ile Ala Glu Ala Met Asp Lys Val Gly Asn Glu Gly Val 160 165 170	591
atc acc gtc gag gag tcc aac acc ttc ggc ctg cag ctc gag ctc acc Ile Thr Val Glu Glu Ser Asn Thr Phe Gly Leu Gln Leu Glu Leu Thr 175 180 185	639
gag ggt atg cgg ttc gac aag ggt tac atc tcg ggc tac ttc gtc acg Glu Gly Met Arg Phe Asp Lys Gly Tyr Ile Ser Gly Tyr Phe Val Thr 190 195 200	687
gac gcc gag cgt cag gaa gcg gtc ctc gag gac ccg ttc atc ctg ctg Asp Ala Glu Arg Gln Glu Ala Val Leu Glu Asp Pro Phe Ile Leu Leu 205 210 215 220	735
gtc agc tcc aag gtc tcg acc gtc aag gac ctg ctg ccg ctg ctg gag Val Ser Ser Lys Val Ser Thr Val Lys Asp Leu Leu Pro Leu Leu Glu 225 230 235	783
aag gtc atc cag gcc ggc aag ccg ctg ctg atc atc gcc gag gac gtc Lys Val Ile Gln Ala Gly Lys Pro Leu Leu Ile Ile Ala Glu Asp Val 240 245 250	831
gag ggc gag gcc ctg tcc acc ctg gtc gtc aac aag atc cgc ggc acc Glu Gly Glu Ala Leu Ser Thr Leu Val Val Asn Lys Ile Arg Gly Thr 255 260 265	879
ttc aag tcg gtg gcc gtc aag gcg ccc ggc ttc ggc gac cgc cgc aag Phe Lys Ser Val Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys 270 275 280	927
gcg atg ctt cag gac atg gcc atc ctc acc ggc ggc cag gtc atc agc Ala Met Leu Gln Asp Met Ala Ile Leu Thr Gly Gly Gln Val Ile Ser 285 290 300	975
gaa gag gtc ggc ctg tcg ctg gag agc gcc gac atc tcg ctg ctc ggt Glu Glu Val Gly Leu Ser Leu Glu Ser Ala Asp Ile Ser Leu Leu Gly 305 310 315	1023
aag gcc cgc aag gtc gtc gtc acc aag gac gag acc acc atc gtc gag Lys Ala Arg Lys Val Val Val Thr Lys Asp Glu Thr Thr Ile Val Glu 320 325 330	1071
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acc gag atc gag aac agc gac tcc gac tac gac cgc gag aag ctg cag Thr Glu Ile Glu Asn Ser Asp Ser Asp Tyr Asp Arg Glu Lys Leu Gln 350 355 360	1167



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Thr Asn Asp Gly Val Ser Ile Ala Lys Glu Ile Glu Leu Glu Asp Pro  
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Tyr Glu Lys Ile Gly Ala Glu Leu Val Lys Glu Val Ala Lys Lys Thr  
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Asp Asp Val Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala Gln  
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Ala Leu Val Arg Glu Gly Leu Arg Asn Val Ala Ala Gly Ala Asn Pro  
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Leu Gly Leu Lys Arg Gly Ile Glu Lys Ala Val Glu Lys Val Thr Glu  
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Thr Leu Leu Lys Ser Ala Lys Glu Val Glu Thr Lys Asp Gln Ile Ala  
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Ala Glu Ala Met Asp Lys Val Gly Asn Glu Gly Val Ile Thr Val Glu  
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Glu Ser Asn Thr Phe Gly Leu Gln Leu Glu Leu Thr Glu Gly Met Arg  
 180 185 190

Phe Asp Lys Gly Tyr Ile Ser Gly Tyr Phe Val Thr Asp Ala Glu Arg  
 195 200 205

Gln Glu Ala Val Leu Glu Asp Pro Phe Ile Leu Leu Val Ser Ser Lys  
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Val Ser Thr Val Lys Asp Leu Leu Pro Leu Leu Glu Lys Val Ile Gln  
 225 230 235 240

Ala Gly Lys Pro Leu Leu Ile Ile Ala Glu Asp Val Glu Gly Glu Ala  
 245 250 255

Leu Ser Thr Leu Val Val Asn Lys Ile Arg Gly Thr Phe Lys Ser Val  
 260 265 270

Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met Leu Gln  
 275 280 285

Asp Met Ala Ile Leu Thr Gly Gly Gln val Ile Ser Glu Glu val Gly  
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Leu Ser Leu Glu Ser Ala Asp Ile Ser Leu Leu Gly Lys Ala Arg Lys  
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val val val Thr Lys Asp Glu Thr Thr Ile val Glu Gly Ala Gly Asp  
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Ser Asp Ala Ile Ala Gly Arg val Ala Gln Ile Arg Thr Glu Ile Glu  
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Asn Ser Asp Ser Asp Tyr Asp Arg Glu Lys Leu Gln Glu Arg Leu Ala  
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Lys Leu Ala Gly Gly val Ala val Ile Lys Ala Gly Ala Ala Thr Glu  
370 375 380

val Glu Leu Lys Glu Arg Lys His Arg Ile Glu Asp Ala val Arg Asn  
385 390 395 400

Ala Lys Ala Ala val Glu Glu Gly Ile val Ala Gly Gly Gly val Ala  
405 410 415

Leu Leu His Ala Ile Pro Ala Leu Asp Glu Leu Lys Leu Glu Gly Glu  
420 425 430

Glu Ala Thr Gly Ala Asn Ile val Arg val Ala Leu Glu Ala Pro Leu  
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Lys Gln Ile Ala Phe Asn Gly Gly Leu Glu Pro Gly val val Ala Glu  
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Lys val Arg Asn Ser Pro Ala Gly Thr Gly Leu Asn Ala Ala Thr Gly  
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Glu Tyr Glu Asp Leu Leu Lys Ala Gly Ile Ala Asp Pro val Lys val  
485 490 495

Thr Arg Ser Ala Leu Gln Asn Ala Ala Ser Ile Ala Gly Leu Phe Leu  
500 505 510

Thr Thr Glu Ala val val Ala Asp Lys Pro Glu Lys Ala Ala Ala Pro  
515 520 525

Ala Gly Asp Pro Thr Gly Gly Met Gly Gly Met Asp Phe  
530 535 540